



ict for **sustainable** homes

November 17-19, 2010 - Plaza Hotel, Nice, France



Energy@home

How to accelerate the diffusion of smart appliances

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Why it is necessary to speed-up the diffusion of “smart appliances” ?

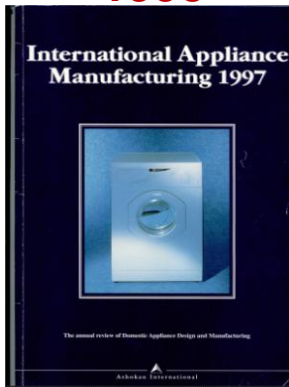
According to the concept of smart grid, the management of electricity consumptions at home requires the presence of a new generation of appliances (smart appliances)

But the time required by the new generation of smart appliances for replacing all the products currently present in the homes is about ten years or more, so it is too long for properly supporting the parallel development of smart grids.

Therefore it is necessary to find a way for speeding up the diffusion of smart appliances!

Past experience of Indesit (former Merloni Elettrodomestici)

1995



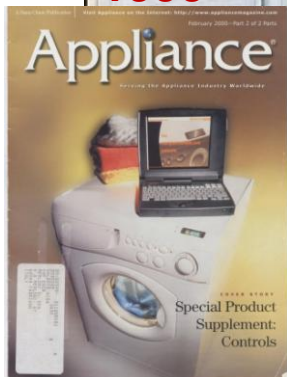
2000



2000



1999



2002



 **ARISTON** digital

The first system of smart appliances (network based on LonTalk)

Reasons why “Ariston digital” has failed

The great pioneering effort made by Indesit in the mid 90s, very appreciated also internationally, could not be finalized to the market for the following three main reasons:

- 1. Total lack of communication rules** (at that time) shared by the various manufacturers of white goods
- 2. Absence of broadband at home** (Internet penetration in the homes relates to recent years and is still in progress)
- 3. Excessive cost of the connectivity**

SOLVED

SOLVED

STILL TO SOLVE !

How to add connectivity to white goods?

A. Using a communication node inside the appliance



B. Adding a connector dedicated to connectivity



C. Using the electronics already present inside the appliance



WRAP = Web Ready Appliances Protocol

Why the introduction of a communication node within a household appliance is still a problem ?

Cost of the “communication node” itself

- It is compatible only with high-end products (niches)

Cost for installing the “communication node” within the appliance

- Its installation would be done on the production line (but actually it is a very complex operation!)

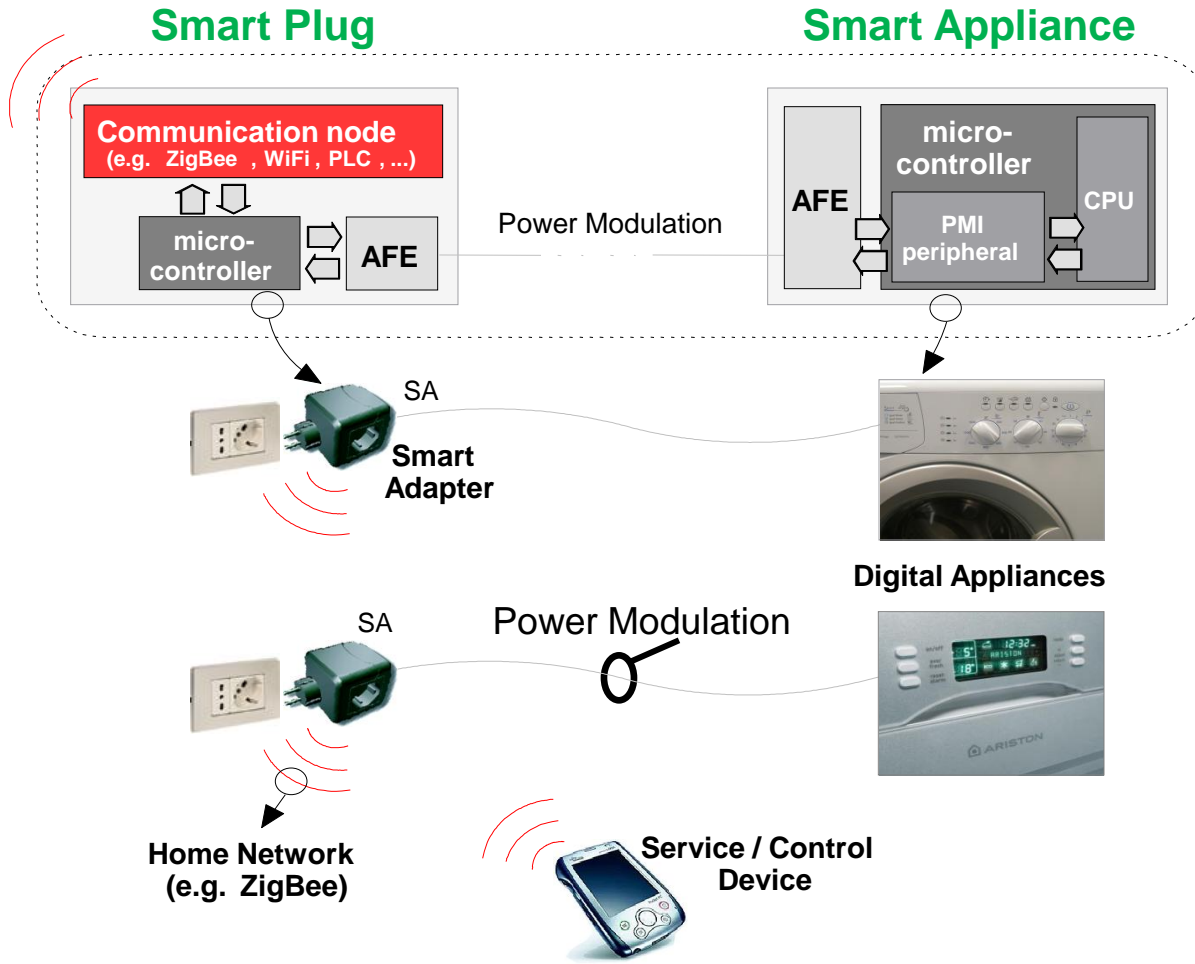
Cost for adapting the appliance to receive the “communication node”

- Mechanical changes: specific positioning of the node
- Electrical changes: extra cables and connectors
- Electronic changes: upgrading the electronic control board

Cost for the maintenance of the “communication node”

- This operation must be done by an authorized technician

Basic concept of Wr@p Technology (or Power Modulation)



The appliance communicates by using its digital control system: **no added cost!**

A specific silicon peripheral, developed by Indesit thanks to the help of University of Parma (prof. Ciampolini's team), has been implemented by Japanese Renesas (Hitachi, Mitsubishi, Nec).

March 29th, 2010:
Indesit and Renesas have signed a non-exclusive royalty-free license agreement

Wr@p Technology main features

1. No cost for the manufacturer of household appliances
2. No need to tie the appliance to a specific network protocol
3. Fully suitable for interacting with a smart grid (Demand Side Management, Multiply tariff management, Dynamic Demand Control, Energy Monitoring)
4. **Capability to easily perform the energy function called “Dynamic Demand Control”**
5. Very easy to implement (peripheral for microcontrollers)
6. Capability to speed up the diffusion of smart appliances
7. Suitable for creating a new generation of “smart plugs & smart sockets”
8. Enabling new high level services (remote assistance, preventive maintenance...)
9. **The appliance can be easily tested during its production without requiring complex and expensive testing tools**
10. **No conflict with a possible “communication node” within a Wr@p enabled white good**

Capability to easily perform the energy function called “Dynamic Demand Control”

CONFIDENTIAL

Under development Preliminary document
Specifications in this document are tentative and subject to change.

RX210 Group

37. Power Modulation Interface (PMI)

37.8 DDC/Frequency Measurement Modes

In DDC/frequency measurement modes, the frequency of the general AC power supply used by the PMI is determined by measuring cycles between the selected edges of the PMVZ signal input from the PMVZ pin.

In DDC mode, the measured cycle stored in PMDCR is compared to the PMDCTR value and the frequency is determined according to the comparison result.

In frequency measurement mode, the upper 8 bits of the measured value stored in PMDCR is compared to the PMFTR value and the frequency is determined according to the comparison result.

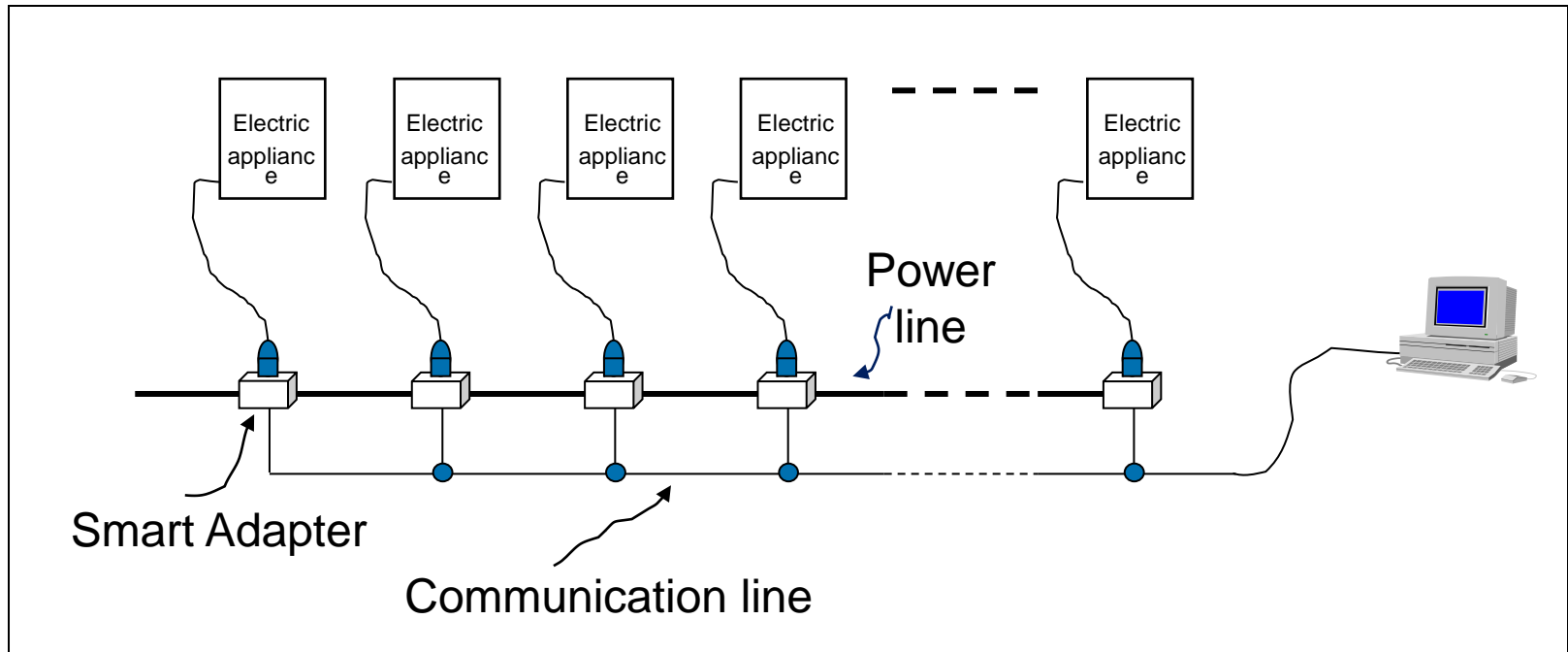
PMI continuously measures the period of AC power supply and generates a DDC interrupt when the measured value is below or above two predefined thresholds (programmable)



The appliance’s control system will manage the DDC interrupt by using a specific algorithm which executes DDC function without affecting the correct working of the appliance itself

See: A. Ricci, B. Vinerba, E. Smargiassi, I. De Munari, V. Aisa, and P. Ciampolini, *Power-Grid Load Balancing by Using Smart Home Appliances*, in Digest of Technical Papers International Conference on Consumer Electronics, Jan. 2008, pp. 1–2.

The appliance can be easily tested during its production without requiring complex and expensive testing tools



The possibility to dialog through its power cable allows the appliance to be easily tested during the production without requiring complex and expensive testing tools

Indesit approach to “smart appliances”

1. First step, suitable for high-end products



1. Second step, suitable for the entire production



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**Thank you very much
for your attention !**

Should you have questions or need more details?

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